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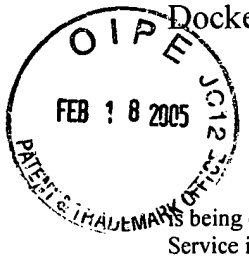

Docket No. 24707A Patent

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Maricee A Richardson

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application	:	
QINGYU ZENG ET AL.	:	
Ser. No. 09/474,536	:	Examiner: Torres Velazquez, N.
Filed: December 29, 1999	:	Group Art Unit: 1771

For: ACOUSTICAL FIBROUS INSULATION PRODUCT FOR USE IN A VEHICLE

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Appeal is taken from the rejection of claims 1-9, 11, 15-18 and 20-24 made in the Office Action mailed on August 19, 2004 and maintained in the Advisory Action mailed on October 28, 2004. No claim has been allowed. A timely Notice of Appeal was filed on December 20, 2004.

I. REAL PARTY IN INTEREST

The co-inventors have assigned 100% of their interest in the present invention as embodied in U.S. Patent Application Serial No. 09/474,536 to Owens-Corning Fiberglass Technology, Inc. ("Appellant"), an Illinois corporation having a place of business at 7734 W. 59th Street, Summit, Illinois 60501.

II. RELATED APPEALS AND INTERFERENCES

Appellant knows of no other appeals or interferences which will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-9, 11, 15-18 and 20-24 remain pending in the application and are the subject of this appeal.

Claims 22 and 24 are rejected under 35 U.S.C. §112, first paragraph, as containing matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. No rejection has been made of claims 22 and 24 based upon the prior art.

Claims 1-9, 15-18, 21 and 23 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 5,773,375 to Swan et al.

Claims 11 and 20 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Swan et al. patent when considered in further combination with U.S. Patent 4,840,832 to Weinle et al.

IV. STATUS OF AMENDMENTS

The form of the claims for purposes of this appeal is as presented in the Amendment and Response filed by Applicants in response to the Office Action dated February 2, 2004. For the convenience of the Board, a copy of the claims is included in an Appendix forming the final section of this Appeal Brief.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to an acoustical insulation product 10. The acoustical insulation product 10 comprises a blanket 12 of fibers and a facing material 14 (see p. 5 lines 3-4). The fibers of the acoustical insulation product 10 typically include primary fibers 16 and multicomponent fibers, in the form of bicomponent polymer fibers 20 (see p. 5 lines 7-9).

The primary fibers 16 can be any type of fiber suitable for providing good structural qualities as well as good acoustical and thermal properties. Preferred fibers for use as the primary fiber 16 are polymer fibers. It is also explicitly stated that the primary fibers can be any mineral fiber such as fibers made of rock, slag and basalt, as well as glass fibers such as wool glass fibers. Further a preferred type of primary fiber for use with the invention is made of polyethylene terephthalate (PET) fibers (see p. 5 lines 21-27).

The bicomponent polymer binder fibers 20 are comprised of a principal polymer component 22 and a binder polymer component 24. The binder polymer component 24 binds the bicomponent polymer fibers 20 and the primary fibers 16 to themselves and to each other (see p. 5 lines 12-20).

The binder polymer component 24 has a softening point lower than the softening point of the principal polymer component 22 so that upon heating the insulation product, the two materials respond differently. Specifically, the insulation product 10 can be heated to a temperature that is above the softening point of the binder polymer component 24 but is below the softening temperature of the principal polymer component 22. This will cause the binder component 24 to soften and become sticky, thereby bonding the various bicomponent polymer binder fibers 20 to themselves where they are in contact. Also, the softening of the binder polymer component 24 will bond the primary fibers 16 to themselves and the bicomponent polymer binder fibers 20. As long as the temperature is not raised as high as the softening point of the principal polymer component 22, that component will remain in the form of fibers (see p. 6 line 19 to p. 7 line 2).

As illustrated in Figures 1, 3 and 4, the acoustical insulation product 10 may have a flange 70 around its perimeter. The flange 70 helps provide stiffness and facilitates installation of the acoustical insulation product 10 into a vehicle. As illustrated in Figure 4, the flange 70 is not centered midway through the thickness of the blanket 12, but rather is closer to the surface containing the facing material 14. The flange is preferably made by molding or pressing the edge portion 72 of the insulation product under conditions of an elevated temperature so that the bicomponent polymer binder fibers 20 soften and bond the primary fibers to each other. After this pressing operation the density of the edge portion of the blanket 12 is significantly greater than the density of the remainder portion 74. (See p. 9 line 14 to p. 10 line 8 and claims 1, 15, 21 and 23).

Claim 2 provides that the primary fibers are polymer fibers. This is described in the specification at, for example, p. 5 lines 22-23. Claims 22 and 24 provide that the primary fibers are polymer fibers other than polypropylene, a narrower subset.

Claim 3 provides that the density of the edge portion 72 of the blanket 12 is significantly greater than the remainder portion 74. Claim 4 provides that the flange 70 has a thickness less than about 15 percent of the thickness of the blanket 12. The subject matter of these claims is found in the specification at, for example, p. 9 line 25 to p. 10 line. 8.

Claim 5 provides that the facing material 14 is water resistant. Claim 6 provides that the facing material 14 is a scrim web and a film, the film having been heat softened to adhere the film and scrim to the blanket 12 of polymer fibers. Claim 7 provides that the scrim is made of polyester fibers and the film is a polypropylene adhesive film. The subject matter of claims 5-7 is found, for example, in the specification at p. 8 line 10 to p. 9 line 13. Claims 16 and 17 relate to the same subject matter.

Claims 8 and 18 provide that the surfaces of the insulation product 10 have static coefficients of friction less than about 0.8. This is described in the specification, for example, at p. 10 lines 17-19.

Claim 9 provides that the blanket 12 of polymer fibers includes polymer binder fibers 20 that have been heated to a temperature sufficient to bond the polymer fibers to the facing material 14. This is described in the text at, for example, p. 9 lines 24-25.

Claims 11 and 20 provide that the primary fibers 16 are polyethylene terephthalate fibers and that the bicomponent binder fibers 20 include a core of polyethylene terephthalate and a sheath of polyethylene terephthalate. This subject matter is described in the specification at, for example, p. 5 line 26 to p. 6 line 8, p. 5 lines 12-16 and p. 7 lines 12-24.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The Board must determine whether the subject matter of claims 22 and 24 has support in the specification.

The Board must determine whether claims 1-9, 15-18, 21 and 23 are anticipated by U.S. Patent 5,773,375 to Swan et al. further evidenced by U.S. Patent 4,837,067 to Carey, Jr. et al. and EP 0538047 A1.

Finally, the Board must determine whether claims 11 and 20 are obvious subject matter under 35 U.S.C. §103(a) over the combination of U.S. Patent 5,773,375 to Swan et al. with U.S. Patent 4,840,832 to Weinle et al.

VII. ARGUMENT

A. The Examiner has failed to establish a *prima facie* basis for the rejection of claims 22 and 24 under 35 U.S.C. §112, first paragraph and the phrase in question, "in which the primary fibers are polymer fibers other than polypropylene", is not new matter.

In the final Office Action dated August 19, 2004, the Examiner rejected claims 22 and 24 under 35 U.S.C. §112, first paragraph stating, "[t]he phrase 'in which the primary fibers are polymer fibers **other than polypropylene**' is new matter, because this negative limitation is not literally supported by the specification." (emphasis in original).

In *Ex parte Parks*, 30 USPQ2d 1234, 1236 (Bd. Pat. App. & Int. 1994), the Board provided a very good summary of the law applicable to this issue. That summary is presented below in its entirety.

> The initial burden of establishing a *prima facie* basis to deny patentability to a claimed invention on any ground is always upon the examiner. *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In rejecting a claim under the first paragraph of 35 U.S.C. 112 for lack of adequate descriptive support, it is incumbent upon the examiner to establish that the originally-filed disclosure would not have reasonably conveyed to one having ordinary skill in the art that an appellant had possession of the now claimed subject matter. *Wang Laboratories, Inc. v. Toshiba Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993). Adequate description under the first paragraph of 35 U.S.C. 112 does not require *literal* support for the claimed invention. *In re Herschler*, 591 F.2d 693, 200 USPQ 711 (CCPA 1979); *In re Edwards*, 568 F.2d 1349, 196 USPQ 465 (CCPA 1978); *In re Werthein*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Rather, it is sufficient if the originally-filed disclosure would have conveyed to one having ordinary skill in the art that an appellant had possession of the concept of what is claimed. *In re Anderson*, 471 F.2d 1237, 176 USPQ 331 (CCPA 1973). (Emphasis in original).

In this opinion, the Board of Patent Appeals and Interferences explicitly states that the first paragraph of 35 U.S.C. §112 does not require literal support for the claimed invention. The Examiner rejects claims 22 and 24 under the first paragraph of 35 U.S.C. §112 because "this negative limitation is not literally supported by the specification." Clearly, the Examiner's stated basis for the rejection under 35 U.S.C. §112, first paragraph is contrary to the holding in *Ex parte Parks* and as such is improper under the law.

In fact, it is respectfully argued that the rejection of claims 22 and 24 made by the Examiner is absolutely contrary to longstanding legal precedent. In *In re Johnson and Farnham*, 194 USPQ 187, 196, 558 F.2d 1008, 1009 (CCPA 1977), it was explicitly held that where a written description supports the claims in the absence of a negative limitation added to overcome a prior art rejection, it must by definition describe the part remaining after the amendment. Specifically, the opinion states, "[h]ere . . . the 'written description' in the 1963 specification supported the claims in the absence of the limitation, and that specification having described the whole, necessarily described the part remaining. The facts of the prosecution are properly presented and relied on, under these circumstances, to indicate that appellants are merely excising the invention of another, to which they are not entitled, and are not creating an 'artificial subgenus' or claiming 'new matter.'" *Id.*

On page 5 line 21 to page 6 line 8 of the present specification the primary fibers 16 are described as "polymer fibers". It is further stated that the primary fibers can specifically be "any mineral fibers such as fibers made of rock, slag and basalt, as well as glass fibers such as wool glass fibers. . . . " Further it is stated that, "[a] preferred type of primary fibers for use with the invention are made of polyethylene terephthalate (PET) fibers. . . ." Clearly, this description of "primary fibers 16" appearing in the specification of the application includes not only polypropylene but many other materials. Thus, it is clear that there is full and complete disclosure for the present invention as set forth in relatively broad

independent claims 21 and 23. The Examiner acknowledges this by making no rejection of these claims under 35 U.S.C. §112. Consequently, there must be full and complete disclosure for the narrower claims 22 and 24.

It is for the inventor to decide what bounds of protection he will seek. See *In re Saunders*, 170 USPQ 213, 220, 444 F.2d 599, 607 (CCPA 1971). In the present case the inventor has decided to merely excise that portion of the present invention disclosed in the present application wherein the primary fibers are made from polypropylene. The Applicant is well within his rights to do so and this rejection should be withdrawn. Since there are no outstanding rejections of claims 22 and 24 based upon the prior art these claims are therefore in condition for formal allowance.

B. U.S. Patent 5,773,375 to Swan et al. fails to anticipate the invention as set forth in claims 1-9, 15-18, 21 and 23.

The standard for lack of novelty or "anticipation" is one of strict identity. As stated by the Court of Appeals for the Federal Circuit in *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 231 USPQ 81, 90, 802 F.2d 1367, 1379 (Fed. Cir. 1986), "it is axiomatic that for prior art to anticipate under section 102 it has to meet every element of the claimed invention. . . ." In *In re Donohue*, 226 USPQ 619, 621, 766 F.2d 531, 534 (Fed. Cir. 1985), it was stated that "an anticipation rejection requires a showing that each limitation of the claim must be found in a single reference, practice or device." As further stated by this Court in *Atlas Powder Co. v. E. I. DuPont de Nemours & Co.*, 224 USPQ 409, 411, 750 F.2d 1569, 1574 (Fed. Cir. 1984), the "exclusion of a claimed element from a prior art reference is enough to negate anticipation by that reference."

Independent claim 1 of the present application refers to an acoustical insulation product comprising a blanket of fibers and a facing material. The

blanket of polymer fibers includes primary fibers and bi-component polymer binder fibers that are made of a principal polymer component and a binder polymer component. The binder component has a softening point lower than the softening point of the principal component and the binder component has been heated to a temperature that is insufficient to soften the principal component but sufficient to soften the binder component so as to bind the bi-component polymer binder fibers and the primary fibers to themselves and to each other.

In formulating a rejection of this claim the Examiner argues that the Swan et al. patent discloses an acoustical insulator formed from an insulation web 15 and a thermoplastic film 14. The web 15 includes melt-blown polypropylene microfibers and crimped bulking fibers or binder fibers such as bicomponent binder fibers.

The Examiner acknowledges that the Swan et al. patent does not explicitly teach heating the binder fibers to a temperature sufficient to soften the binder component and not the principal component of the bicomponent polymer binder fibers but argues that it would have been obvious to do so based upon the type of fiber utilized. As support for this assumption or modification the Examiner refers to EPO 538047 A1 (see, for example, pp. 2 and 3 of the file Office Action bearing a mailed date of August 19, 2004).

In the Advisory Action with a mailed date of October 28, 2004, the Examiner stated, "[w]ith regards to arguments on the limitations reciting that "the blanket is heated to a temperature insufficient to soften the principal component but sufficient to soften the binder component", the Examiner maintains the position that the prior art of Swan et al. does provide the structure claimed and the heating step is implied by the use of this type of fibers as sted in the final office action." (Emphasis added).

It is respectfully argued by the Applicant that the Swan et al. reference implies no such teaching and that the Examiner can only arrive at this

modification by utilizing hindsight and the knowledge and teachings of the present application.

More specifically, the book "Modern Polyesters: Chemistry and Technology of Polyesters and Copolyesters" (Exhibit A) provides a very enlightening description of bicomponent fibers. A portion of the description of bicomponent or bico fibers from page 427 of that book is reprinted immediately below for the convenience of the Board.

> Bico fibers are a new class of fibers, rather than a sub-set of PET fibers. Such fibers are formed from two different polymers, which are melted separately, and then combined into a single fiber at the last moment before extrusion. In some cases, the fibers are actually extruded separately, and then combined beneath the spinneret while they are still molten, so that they fuse together after spinning.

(John Scheirs et al. eds., 2003)

It is respectfully requested that the Board turn its attention to the second sentence of this quote. In that sentence it is noted that bi-component fibers are formed from two different polymers and states that they are melted separately. It then goes on to explicitly teach that they are then combined into a single fiber at the last moment before extrusion.

As should be appreciated from reviewing the Swan et al. patent, the web 15 is formed by extrusion. In particular the Board's attention is directed to, for example, col. 3 lines 6-11, col. 8 lines 34-53, col. 9 lines 28-33, col. 10 lines 2-5 and 56-64 and col. 11 lines 23-26 and 28-33 of that reference. Since the web 15 in Swan et al. is an extrusion, it follows from reading the "Modern Polyesters: Chemistry and Technology of Polyesters and Copolyesters" reference that both components of the bi-component fiber are melted and combined into a single fiber at the last moment before extrusion. Of course, the melting of both components of the bi-component fiber is contrary to the structure set forth in present claim 1 wherein the principal component maintains its fiber identity (see p. 7 lines 1-2 of

the present application). Thus, a clear structural distinction is established between the presently claimed invention as set forth in claim 1 and the disclosure in the Swan et al. reference. Further and perhaps more importantly, the teaching in "Modern Polyesters . . ." relating to the melting of both components of a bicomponent fiber in an extrusion process is absolutely contrary to the heating step "implied" by the Examiner.

Claims 2-9 which depend from claim 1 and are rejected on the same grounds are equally allowable for the same reasons.

Independent claim 15, like claim 1, explicitly provides that the binder component has been heated to a temperature that is insufficient to soften the principal component but sufficient to soften the binder component to bond the bi-component polymer binder fibers and primary fibers to themselves and to each other. Accordingly, independent claim 15 patentably distinguishes over the Swan et al. reference for the same reasons as claim 1. This is also true of claims 16-18 dependent thereon.

Independent claims 21 and 23 also include the limitation relating to the heating of the binder component set forth in claims 1 and 15 that is the basis for those claims distinguishing over the Swan et al. reference. Accordingly, these two independent claims should also be allowed.

It should also be noted at this time that there is also no basis whatsoever to modify the Swan et al. reference based upon the teachings of EP 0538047 A1 in order to maintain the rejection. More specifically, as noted above the Swan et al. reference relates to an extruded web. As pointed out in the "Modern Polyesters . . ." reference cited by the Applicant in this Appeal Brief, both components of bi-component fibers utilized in an extrusion process are melted together and combined into a single fiber at the last moment before extrusion. Applicant fails to note where EP 0538047 A1 relates to the extrusion process or provides any teaching relevant to the extrusion of bicomponent fibers. Accordingly, there is no basis to modify the Swan et al. process as suggested by the Examiner unless

general and established extrusion practice is to be ignored and the knowledge and teachings of the present invention are to be utilized as a guide in making the proposed modification. Such use of hindsight is clearly improper under the law. See, for example, *Ex parte Clapp*, 227 USPQ 972 (Bd. Pat. App. & Int. 1985).

In fact, since the Swan et al. reference teaches extruding the web 15, the Swan et al. reference effectively teaches melting both the principal component and the binder component of the bi-component fibers in accordance with standard extrusion practice as evidenced by the "Modern Polyesters . . ." reference. This is in stark contrast to the softening of only the binder components of those fibers as set forth in independent claims 1, 15, 21 and 23 of the present application. Thus, it is clear that the Swan et al. reference actually teaches away from the present invention. It is well established that it is error to find obviousness, much less anticipation, where a reference teaches away from the invention at hand. See *W. L. Gore & Associates, Inc. v. Garlock, Inc.*, 220 USPQ 303, 311, 721 F.2d 1540, 1550 (Fed. Cir. 1983) and *In re Fine*, 5 USPQ 2d 1596, 1599, 837 F.2d 1071, 1074 (Fed. Cir. 1988). Accordingly, the rejection of claims 1-9, 15-18, 21 and 23 based upon U.S. Patent 5,773,375 Swan et al. is improper and should be withdrawn.

C. Claims 11 and 20 clearly patentably distinguish over U.S. Patent 5,773,375 to Swan et al. when considered in further combination with U.S. Patent 4,840,832 to Weinle et al.

On page 7 of the final Office Action bearing a mailed date of August 19, 2004, the Examiner acknowledges that the Swan et al. reference fails to teach the use of polyethylene terephthalate (PET) fibers as the primary fibers and the use of PET in the core and sheath of the bi-component binder fibers.

In order to provide this missing teaching the Examiner cites the secondary reference to Weinle et al. alleging that it "teaches the use of bi-component fibers . . . wherein the core is formed of a relatively high melting polyethylene terephthalate

polymer (PET) and the sheath comprises a PET co-polymer having a much lower melting temperature." The alleged motivation for the combination is to "provid[e] an insulation material with a molded bat of fibers that remains highly deformable and resilient as disclosed by Weinle et al. (col. 3 lines 56-68)".

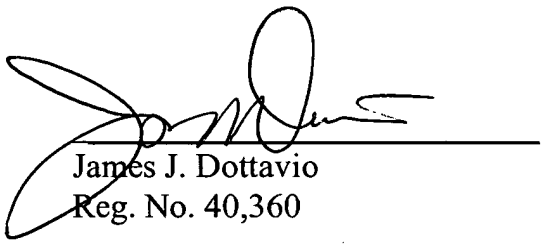
The stated goal of "providing an insulation material with a molded bat of fibers that remains highly deformable and resilient" is insufficient to explain why a skilled artisan would have selected the bi-component fibers of the Weinle et al. reference for use in the arrangement disclosed in Swan et al. Indeed, nothing in the record establishes that the alleged combination would even meet this goal, including when the fibers are heated as required in the corresponding independent claim. In the absence of evidence showing why a skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed, a *prima facie* case of obviousness is lacking with respect to claims 11 and 20.

Further, even if the combination is made, it does not address the fact that the web 15 in the Swan et al. reference is an extrusion. As made clear from the discussion of bi-component fibers in the "Modern Polyesters . . ." reference cited above, it is standard practice for those skilled in the art to melt both the binder component and principal component of bi-component fibers and combine them into a single fiber at the last moment before extrusion. Accordingly, even if bi-component fibers with a core and sheath both made of PET were utilized in the Swan et al. web as suggested by the Examiner, both components would be melted. As such, the principal component of the bi-component fiber would be melted and the resulting product would have a different structure (i.e. the principal component would not retain its fiber form as set forth in the present invention (see, for example, page 7 lines 1-2)). As such, even if the proposed combination of references were made, it does not teach or suggest the present invention as set forth in claims 11 and 20. Accordingly, these claims patentably distinguish over the cited art and should be allowed.

In summary, Appellant has addressed and met every rejection set forth in the final Office Action. Upon careful review of the cited references in light of these comments, it is believed that the Board will agree that all of the presently pending claims patentably distinguish over the prior art and should be formally allowed. Accordingly, it is respectfully requested that the rejections of the Examiner relating to claims 1-9, 11, 15-18 and 20-24 be reversed and that the present application be remanded to the Examiner for allowance.

Respectfully submitted,

OWENS CORNING



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VIII. CLAIMS APPENDIX

The claims on Appeal read as follows:

1. (Previously presented) An acoustical insulation product for a vehicle comprising a blanket of fibers and a facing material adhered to a major surface of the blanket, the product having a densified perimeter flange, the flange providing stiffness to the product, and the flange being capable of being held in place on the vehicle by an attachment system; said blanket of polymer fibers including primary fibers and bi-component polymer binder fibers that are made of a principal polymer component and a binder polymer component, the binder component having a softening point lower than the softening point of the principal component, and the binder component having been heated to a temperature that is insufficient to soften the principal component but sufficient to soften the binder component to bond the bi-component polymer binder fibers and the primary fibers to themselves and to each other.

2. (Previously presented) The acoustical insulation product of claim 1 in which the primary fibers are polymer fibers.

3. (Original) The acoustical insulation product of claim 1 in which the density of the edge portion of the blanket is significantly greater than the remainder portion of the blanket.

4. (Original) The acoustical insulation product of claim 1 in which the flange has a thickness less than about 15 percent of the thickness of the blanket.

5. (Original) The acoustical insulation product of claim 1 in which the facing material is water resistant.

6. (Original) The acoustical insulation product of claim 1 in which the facing material is a scrim web and a film, the film having been heat softened to adhere the film and scrim to the blanket of polymer fibers.

7. (Original) The acoustical insulation product of claim 6 in which the scrim is made of polyester fibers and the film is a polypropylene adhesive film.

8. (Original) The acoustical insulation product of claim 1 in which the surfaces of the insulation product have static coefficients of friction less than about 0.8.

9. (Original) The acoustical insulation product of claim 1 in which the blanket of polymer fibers includes polymer binder fibers that have been heated to a temperature sufficient to bond the polymer fibers to the facing material.

10. (Canceled)

11. (Previously presented) The acoustical insulation product of claim 1 in which the primary fibers are polyethylene terephthalate fibers and in which the bicomponent binder fibers include a core of polyethylene terephthalate and a sheath of polyethylene terephthalate.

12-14. (Canceled)

15. (Previously presented) An acoustical insulation product for a vehicle comprising a blanket of polymer fibers and a water resistant facing material adhered to a major surface of the blanket, the product being capable of being held in place on the vehicle by an attachment system; said blanket of polymer fibers including primary fibers and bi-component polymer binder fibers

that are made of a principal polymer component and a binder polymer component, the binder component having a softening point lower than the softening point of the principal component, and the binder component having been heated to a temperature that is insufficient to soften the principal component but sufficient to soften the binder component to bond the bi-component polymer binder fibers and the primary fibers to themselves and to each other.

16. (Original) The acoustical insulation product of claim 15 in which the facing material is a scrim web and a film, the film having been heat softened to adhere the film and scrim to the blanket of polymer fibers.

17. (Original) The acoustical insulation product of claim 16 in which the scrim is made of polyester fibers and the film is a polypropylene adhesive film.

18. (Original) The acoustical insulation product of claim 15 in which the surfaces of the insulation product have static coefficients of friction less than about 0.8.

19. (Canceled)

20. (Previously presented) The acoustical insulation product of claim 15 in which the primary fibers are polyethylene terephthalate and in which the bicomponent binder fibers include a core of polyethylene terephthalate and a sheath of polyethylene terephthalate.

21. (Previously presented) An acoustical insulation product for a vehicle comprising a blanket of fibers and a facing material adhered to a major surface of the blanket, the product having a densified perimeter flange, the flange providing stiffness to the product; said blanket of polymer fibers including primary fibers

substantially free of melt blown fibers and multi-component polymer binder fibers that are made of a principal polymer component and a binder polymer component, the binder component having a softening point lower than the softening point of the principal component, and the binder component having been heated to a temperature that is insufficient to soften the principal component but sufficient to soften the binder component to bond the multi-component polymer binder fibers and the primary fibers to themselves and to each other.

22. (Previously presented) The acoustical insulation product of claim 21 in which the primary fibers are polymer fibers other than polypropylene.

23. (Previously presented) An acoustical insulation product for a vehicle comprising a blanket of polymer fibers and a water resistant facing material adhered to a major surface of the blanket; said blanket of polymer fibers including primary fibers substantially free of melt-blown fibers and bi-component polymer binder fibers that are made of a principal polymer component and a binder polymer component, the binder component having a softening point lower than the softening point of the principal component, and the binder component having been heated to a temperature that is insufficient to soften the principal component but sufficient to soften the binder component to bond the multi-component polymer binder fibers and the primary fibers to themselves and to each other.

24. (Previously presented) The acoustical insulation product of claim 23 in which the primary fibers are polymer fibers other than polypropylene.

EXHIBIT A

Modern Polyesters: Chemistry and Technology of Polyesters and Copolyesters

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voids in the fibers. These voids can act as reservoirs for moisture, and will also decrease light transmission and increase the reflectance properties of the fibers.

6.6 HIGH-SHRINK FIBERS

While high fiber shrinkage is not usually desirable, benefits can occur when high- and low-shrink fibers are intimately combined. As the yarn or fabric shrinks due to the high-shrink component, the excess length in the low-shrink component forms loops at the yarn and fabric surfaces, thus providing texture. In filament yarn fabrics, these projecting loops can mimic the feel and appearance of staple yarn fabrics. Lack of crystallization in oriented fibers will allow high shrinkage, so that copolymers or non-heatset (non-crystallized) PET fibers can be used for these purposes.

6.7 LOW-MELT FIBERS

Non-crystalline polymers or copolymers can also be used to generate fibers with relatively low softening temperatures. Such fibers can be blended with regular fibers, e.g. staples, and bonded together by applying sufficient heat to melt the low-temperature component. Such fibers need not be exotic. The use of undrawn, amorphous fibers suffices for many such purposes, for example, bonded nonwoven webs formed from a mix of drawn and undrawn PET staple fibers. Without crystalline structure, the undrawn fibers will soften and become tacky at relatively low temperatures, so providing bond sites.

6.8 BICOMPONENT (BICO) FIBERS

Bico fibers are a new class of fibers, rather than a sub-set of PET fibers. Such fibers are formed from two different polymers, which are melted separately, and then combined into a single fiber at the last moment before extrusion. In some cases, the fibers are actually extruded separately, and then combined beneath the spinneret while they are still molten, so that they fuse together after spinning.

The most common cross-sectional fiber shapes are core–sheath (c/s) and side–side (s/s) configurations (Figure 12.16). By encasing a PET core in a modified sheath, it is possible to provide desirable surface characteristics (e.g. antistat/antisoil) with minimal effect on fiber strength. A popular application is to use sheath material with a lower melt point than the core. A fabric (nonwoven or conventional) can be formed from such fibers, and then heated to a temperature sufficient to melt the sheath to bond the fibers together (Figure 12.17). Since the core component is not melted, the fused fiber retains its integrity and strength.

The side–side configuration is typically used to impart crimp to the fiber. If the fiber is formed from polymers with different shrinkage characteristics, and

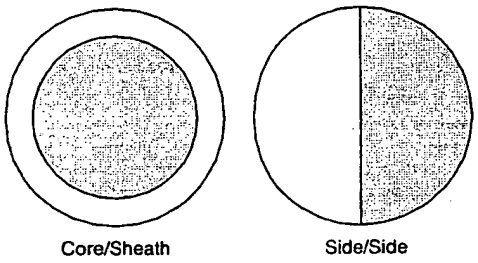

Figure 12.16 Common cross-sectional shapes for bico fibers

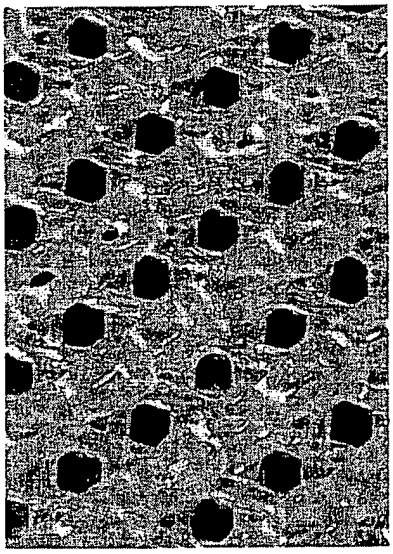

Figure 12.17 Photomicrograph of tricot knit fabric, made from core/sheath (C/S) bico filament yarn and thermally fused after knitting. Photograph reproduced by permission of KoSa Corporation

treated after fiber formation to develop the shrinkage, the differential contraction will cause the fibers to coil into a helical shape and provide three-dimensional crimp. Such self-crimping fibers provide a different type of bulk and hand than do conventionally crimped fibers.

Bico fibers have been available for at least 30 years, but only recently have they developed widespread applications. Bico production equipment is relatively more complex and expensive, and so the fibers require higher selling prices. As these fibers become more common in specialty markets, production cost is decreasing, so that they are now beginning to find uses in commodity applications.